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CONTENTS.

INSECT PESTS OF TEA IN NORTH-EAST INDIA DURING THE SEASON 1915.

(Extract from the report of the General Committee, Indian Tea Association, for the year ended 31st December 1915, p. 38.)

"The distribution and depredation of insect pests and fungus "blights vary in different districts and from year to year, and at "present no readily accessible records exist of the damage done by "such pests to tea in past years. It has, therefore, been suggested "that there should be published, each year, in Part I of the Scien- "tific Department Quarterly Journal, an account of the distribution "of and damage done, by insects and fungi throughout the tea "districts of North-East during the preceding year. The Ento- "mologist and Mycologist spend a great part of their time on tour, "but it is impossible for them to visit each district several times a "year, and, therefore, impossible for them to write such an account "unassisted. It has, therefore, been decided to ask all the Chair- "men of District Committees to supply information on the insect "and fungus pests of their respective districts each year. This "information will then be handed over to the two officers concern- "ed, who, with such aid, will be able to compile and publish a "record of the nature and intensity of insect and fungus attack in "the tea districts year by year."

The following report is an attempt to give effect to the foregoing resolution as regards pests, and is based on information received from the Chairmen of the different Sub-Districts, supplemented by observations made by the Entomologist when on tour.

The information contained in this report is scanty, the reason being that the number of replies received from the planters concerned was small. This was doubtless due in great part, to the fact that the suggestion was only put forward at the end of the season, and that, as District Chairmen had not expected to be asked to give

information of this nature, they had not paid particular attention to these things during the season. Another reason, we believe, was that we had not made sufficiently clear the things that we wished to know. Every planter knows that different pests are more serious one year than another, and that sporadic attacks of uncommon pests occasionally occur in different districts, for whose sudden appearance and disappearance no one is able to give adequate reasons. These variations in intensity of attack may be due to any or all of a variety of causes, but, as at present no records exist of the prevalence and intensity of these pests during past years, it is impossible to compare any unusual phenomenon with a previous similar one, and no opportunity is afforded of discovering some circumstance, common to the two cases, by which the phenomenon might be satisfactorily accounted for. Unless these variations and occurrences are put on record, we shall remain in this unsatisfactory position, and shall continue to regard as miracles things which we would be in a position, given sufficient data to thoroughly comprehend and possibly anticipate. Until we do comprehend these things we shall certainly never be able to prevent them. It was with the idea of obtaining these records, and putting them into permanent form for reference, that the suggestion was put forward that Sub-District Chairmen should be circulated and asked to give information on the occurrence and intensity of insect and fungus attacks in their respective districts during the past season. They were asked to give the names of the pests and blights occurring in the district, whether the attack was worse or less than usual, the approximate period during which the attack was evident, and the approximate period during which it was at its maximum.

Had such reports been received from all districts, a great deal of information would have been gained. As it is, the reports received have been so few that, but for the fact that the officers concerned have by now obtained a fairly accurate idea of the general distribution and relative importance of the different pests and blights of tea, they would have received an entirely erroneous impression of the depredations of these pests in North-East India during the past year. Greenfly, according to the records received, is of no importance, whereas we know the opposite to be the case.

It is earnestly hoped that planters, after perusing this report, will obtain a clearer conception of the sort of information which is required, and will do their utmost to help in the matter in subsequent seasons.

A similar report by the Mycologist on fungus blights is held over for the next number of this journal on account of the very small amount of information up to the present supplied from the various districts.

Insect Pests.

A notable feature of insect attack in tea during the past season was the increased prevalence of certain minor caterpillar pests of tea, such as gelatine grubs and red slug. Another feature was the occurrence of a swarm of locusts, affecting the Darjeeling, Terai, and Duars districts. This has been fully described in a previous number of this journal. An interesting point in connection with mosquito blight is brought out by the records received from the Terai. This pest was much worse than last year in the Northern part of the Terai, below Kurseong, and at its worst in May to July, but slightly less than usual in the southern gardens around Siliguri, and at its height in July to September. This difference was apparently, in some part, at any rate, due to climatic variations. When the number of rainy days in May, June, and July is large, with steady rain and gloomy conditions generally, *Helopeltis* goes ahead with much greater rapidity than when the number of rainy days is small, with heavy rain on those days and bright sunshine in the intervals. Judged from this standpoint, the official rainfall returns afford indications that, at Siliguri, climatic conditions were slightly less favourable to *Helopeltis* than usual during the above period, while at Kurseong they were more so, thus :—

The average number of rainy days at Siliguri during the period May, June, and July is 54·3, with an average fall per rainy day of 1·25 inches; during May, June, and July of 1915 there were only 52 rainy days, and the average fall per rainy day was ¼ inch higher, *viz.*, 1·49 inches. At Kurseong, for the same period, the average number of rainy days is 64, with an average

fall per rainy day of 1·34 inches; during May, June, and July 1915, however, there were 74 rainy days, with a smaller fall per rainy day, *viz.*, 1·26 inches.

The Tea Mosquito.

(*Helopeltis theivora.*—Waterh.)

Darjeeling-Terai.—This pest was much worse than last year in the Northern part of the Terai, below Kurseong, and its worst in May to July, but slightly less than usual in the Southern gardens around Siliguri and at its height here in July to September.

The season 1915 was notable for the wonderful way in which tea, and especially China bushes, flushed at the back end of the season in Assam, and China tea appears to have been similarly affected in the Terai, for one manager notes that the China tea came through the attack, while good 'jat' tea never really recovered.

Duars.—When the Entomologist was in the Western Duars in September *Helopeltis* was fairly bad in that district, but it lifted afterwards. The Chulsa district was on the whole less seriously affected than last year, although two gardens afterwards rather more than usual. The pest was at its worst here in October. The only other district in the Duars from which a report has been received is the Jainti-Sankos district and *Helopeltis* did not occur there at all.*

Assam.—The Margherita district was reported to be free from Mosquito Blight. It was, however, reported from Doom Dooma, the attack though very slight, being worse than last year. The insect was active from February to end of the season, and was at its worst in October. In Bishnath the pest was very bad this season. The sandy gardens of this district are more liable to attack by the pest than the stiff bank gardens. Tezpur was reported free. Parts of Sibsagar suffered a little more than usual. The Jorhat district remained comparatively free, while in Golaghat the pest was much more virulent than usual, owing to the climatic conditions being

* It is unfortunate that no report was received from the Dina-Toorsa and Toorsa-Jainti districts in order to enable the Entomologist to record the alleged spread of Mosquito Blight in these districts.

much more favourable to the pest than last year. Mangaldai wa free from Mosquito Blight.

CACHAR.—Very few reports were received from Cachar. When the Entomologist was in the district in September the pest had made less headway than usual in the districts he visited, but it apparently became more serious in October, and reports from the Chutla Bheel and Luckipore refer to the pest as more serious this year than last, the attack being at this worst in October and November.

SYLHET.—The Balisera district, and the Luskerpore district, were free from the attacks of the pest throughout the season.

RED SPIDER.

(*Tetranychus bioculatus.*—W. M.)

DARJEELING-TERAI.—This pest is reported from one garden in the Northern part of the district as being much worse than last year, and as being unamenable to the action of sulphur. Two gardens in the southern part of the district, however, report less red spider than last year, and that sulphur was used successfully. This pest was worst in May.

DUARS.—Red spider has been less serious than usual in the Duars during the past season, and was at its worst in May. Sulphur has been generally used, with varying success.

ASSAM.—Red spider is not reported as a serious pest from any district in Assam.

CACHAR AND SYLHET.—Certain gardens in these districts which were affected by the floods, and others with soil which is difficult to drain, appear to have suffered from worse red spider attack than usual during the past season, but elsewhere damage due to this pest has been less than usual.

TERMITES.

(*Termes* (*Odontotermes*) *sp.*)

Serious damage by these pests is reported from Tezpur and South Sylhet. The Entomologist also noticed serious termite attack in North Lakhimpur.

RED SLUG.

(*Heterusia magnifica.*—Butl.)

DUARS.—A slight attack of this pest, less serious than usual, at the beginning of the season, is reported from the Chulsa district

of the Duars. Thullying round the bushes and collecting the slugs kept the pest down.

ASSAM.—This caterpillar was slightly more prevalent than usual in the Mangaldai district, though the damage done was small, and was conspicuous in April, July, and September-October. The Entomologist noticed considerable number of red slug caterpillars on a garden in Tezpur in October.

DARJEELING-TERAI.—A few red slug caterpillars were found in parts of the Terai at the beginning of the season, but little damage was done.

LOOPER.

(*Biston suppressaria.*—Guen.)

The area in which this pest was most noticeable throughout the past season extends along the right bank of the Brahmaputra, comprising the districts of North Lakhimpur, Bishnath, Tezpur, and Mangaldai. Although present in other districts, it did not occur in sufficient numbers to attract the notice of the planters. In most cases in which the pest was noticed the autumn brood did most damage.

NETTLE GRUBS.

(*Thosea spp.*)

These are only reported from the Duars as being noticeable in the tea.

FAGGOT & BAG WORMS.

(*Clania spp.*)

These pests are reported as of slight occurrence in the Duars, Cachar, and Mangaldai.

LOCUSTS.

(*Acridium peregrinum.*—Oliv.)

A swarm of locusts visited the Darjeeling, Terai, and Duars districts in July, but did comparatively little damage to the tea (see this Journal, Part III, 1915, pp. 63–67, for an account of this swarm.)

GREEN FLY.

(*Empoasca flavescens.*—Fab.)

A slight attack of this pest; slightly worse than that of last year, is reported to have occurred in Bishnath in May.

E. A. A.

SOIL DENUDATION AND SURFACE DRAINAGE: THE CONSERVATION OF MOISTURE.

Being the Report of Committee "E" at the Meeting of the Board of Agriculture, held at Pusa in February 1916.

MEMBERS OF COMMITTEE "E."

1. Mr. A. Howard (*Chairman*).
2. Mrs. G. L. C. Howard.
3. Mr. G. F. Keatinge.
4. „ R. D. Anstead.
5. „ A. A. Meggitt.
6. Dr. G. D. Hope.
7. Mr. T. Bainbrigge-Fletcher.
8. „ C. M. Hutchinson.
9. „ G. Clarke.
10. „ G. R. Hilson.
11. „ M. M. Mackenzie.

VISITORS.

12. Mr. W. Roberts.
13. „ J. Mackenna.

* * * * *

It is proposed in this report to consider soil denudation (erosion) in connection with surface drainage as both these subjects are intimately related. The conservation of moisture is dealt with separately.

I.—SOIL DENUDATION AND SURFACE DRAINAGE.

The occurrence of soil erosion in the monsoon-fed tracts of India is so widespread, and the loss of soil—the natural agricultural capital of the country—is so considerable that it is unnecessary in this report to attempt any summary of the literature or of the notes submitted to the Board. There is very general agreement that soil denudation is exceedingly harmful and that it should be checked whenever possible.

2. PLANTING DISTRICTS.—It is a fortunate circumstance that the Board, at this meeting, included among its members of a scientific officer who is conversant not only with the tea districts of North-Eastern India but also with the circumstances of the planting areas in Ceylon and Java. The Committee attach particular importance to Dr. Hope's description of the elaborate systems of terracing and drainage for controlling the rain-wash on the Java Tea Estates and they accept his views as to the general adaptability of these methods to conditions in Assam and elsewhere. His report will naturally form the basis for further work on this subject in India and it is suggested that his paper be printed in the Agricultural Journal of India so as to have the widest publicity possible. While no doubt an increased and increasing amount of attention will be paid to the prevention of rain-wash in planting districts and to surface drainage generally, the fact remains that much irreparable mischief has already been done which can never be remedied by any system of manuring. It therefore, appears desirable to consider, at this stage, whether something cannot be done to control planting enterprise in the future and to preserve the natural fertility of such areas. The Committee recommend that the Government of India be asked to bring to the notice of planters through the medium of the Indian Tea Association, the United Planters' Association of Southern India, District Officers, and other convenient channels, the fact that the serious losses due to soil erosion in the planting districts, which have taken place in the past, are to a large extent preventable. They invite attention to the notes on the methods of prevention adopted elsewhere in India in connection with other crops and particularly to the methods advocated by Dr. Hope and Mr. Anstead. Should precautions not be generally adopted in future when new areas opened, steps may have to be taken to enforce regulations preventing erosion, when considering the terms on which these lands are given out to planters.

3. OTHER AREAS.—It will be convenient to consider these areas, which form the bulk of agricultural India, in two parts—(1) Peninsular India south of the Ganges and Jumna, (2) the alluvial tracts including the Indo-Gangetic plain and the Assam Valley. Burma was not considered separately as its soils, for the most part,

fall into two groups not very dissimilar as regards the occurrence of soil erosion to (1) and (2) above.

4. Peninsular India will first be considered. In view of the fact that in Bombay a preliminary enquiry on erosion has already been completed and definite proposals have been formulated by the Director of Agriculture, the Committee consider that all the circumstances are particularly favourable for the inception of an organised attempt to deal with erosion in this Presidency on broad lines and in a systematic manner. They accordingly recommend that the Government of India be requested to place at Mr. Keatinge's disposal for a period of five years, an engineer with special aptitude for agricultural work, whose sole duties will consist in the preparation and execution of schemes of embankment and drainage adapted to local conditions. These will serve both as an object lesson in Bombay itself and also for other provinces. Should the scheme prove a success, as there is every reason to expect it will, a beginning will have been made, after which progress is likely to be rapid both in the Bombay Presidency and also in the other tracts of Peninsular India.

As regards the alluvial tracts of Northern India the position is as follows. The results obtained by the application of the Pusa system of surface drainage, not only in Bihar but also at Cawnpore, show that by this means the cropping power of the land can be materially increased. An object lesson of the advantage of this system when applied to an indigo estate was seen by the Committee on the Dholi estate. In order, however, to make the best use of this method of drainage it is essential to regard the matter in a broad way and to consider the drainage areas of the various tributaries of the Ganges as a whole. Unless these rivers efficiently perform their functions as natural drains, the application of local drainage schemes is restricted and the best results cannot be obtained. These considerations apply with particular force to North Bihar where the natural drainage of the country is now so interfered with by embankments of various kinds that the high flood level is rising at the rate of several inches a year. The result is an increasing amount of injury to the crops, including the indigo industry. The matter is of such urgency that steps

have already been taken by the Commissioner of Tirhoot to improve the drainage of North Bihar as a whole and to prevent as far as possible the recurrence of floods. The Collectors have been consulted as well as the District Boards and the evidence of the local Engineers, including the Railway authorities, has been collected. A meeting was called by the Commissioner of Tirhoot last December when all the agricultural interests in the Division were fully represented. Mr. Morshead's proposal for the immediate preparation of a drainage map of the Division was not only accepted but met with tha cordial support of all concerned—the District Boards, the local Engineers, the Zemindars and the Bihar Planters' Association.

5. The Committee feel that it cannot do better than endorse this scheme which will serve as a useful object lesson for the treatment of similar areas in the plains of India.

II.—The Conservation of Moisture.

6. In general, the Committee feel that the advantages of interculture and of surface cultivation generally are so well known in many parts of India and so much attention is being paid to this subject by the Agricultural Department that no general resolution on this matter is necessary. At the same time they feel that the last work on this subject has not been said and that a great deal remains to be done both to improve the best indigenous practices and also to introduce these methods into new localities.

7. The results obtained at Quetta on the saving of water in what growing show that even in this arid tract, where land is abundant and water scarce, a great deal of irrigation water is wasted. On every 100 acres of irrigated wheat in the Quetta valley the water lost every year could produce, if used to the best advantage, wheat and bhusa worth Rs. 50,000. The Committee feel that any efficient experiments having for their object the discovery of the best means of increasing the duty of water should be encouraged and developed by the Agricultural Department. There is evidence for the belief that a great deal of valuable irrigation water is being wasted in Northern India and that the present supplies could be

spread over much larger areas. This would mean a larger revenue to Government, and increased opportunities for the settlement of the surplus population of the congested areas.

8. The possibilities of the saving of water in crop production are by no means restricted to canal irrigation in Northern India. Much remains to be done in working out the best duty of water in the case of tanks in Peninsular India as well as in the production of rice in several river deltas.

III.—Summary.

9. Finally, the conclusions and recommedations of the Committee may be summarised as follows :—

(*a*) That Dr. Hope's paper on the prevention of soil erosion in Java be published in the Agricultural Journal of India in view of the adaptability to Indian conditions of the methods described therein.

(*b*) That a resolution be submitted for the consideration of the Board of Agriculture to the effect that the Government of India be asked to bring to the notice of planters through the medium of the Indian Tea Association, the United Planters' Association of Southern India, District Officers, and other convenient channels the fact that the serious losses due to soil erosion in the planting districts, which have taken place in the past, are, to a large extent, preventable ; that the most effective measures should be taken now on existing areas and when new areas are opened. Failing this, it may be necessary for Government to reconsider the conditions on which new lands are given out.

(*c*) That the Government of India be requested to place at the disposal of the Agricultural Department of Bombay an engineer with experience and aptitude for agricultural work whose sole duties will consist in the preparation and execution of schemes of embankments and drainage adapted to local conditions.

(*d*) That the Board endorses the drainage scheme of the Commissioner of Tirhoot and considers that it is deserving of all official support possible.

(*e*) That any efficient experiments having for their object the discovery of the best means of increasing the duty of irrigation water should be encouraged and developed by the Agricultural Department.

Resolutions to be Proposed on Soil Erosion and Surface Drainage.

1. The Board suggests that the Government of India be asked to bring to the notice of planters through the medium of the Indian Tea Association, the United Association of Southern India, District Officers and other convenient channels the fact that the serious losses due to soil erosion in the planting districts, which have taken place in the past, are, to a large extent, preventable; that the most effective measures should be taken now on existing areas and when new areas are opened. Failing this, it may be necessary for Government to reconsider the conditions on which new lands are given out.*

2. The Board recommends that the Government of India be requested to place at the disposal of the Agricultural Department of Bombay an engineer with experience and aptitude for agricultural work whose soil duties will consist in the preparation and execution of schemes of embankments and drainage adapted to local conditions.

3. The Board endorses the drainage scheme of the Commissioner of Tirhoot and considers that it is deserving of all official support possible.

4. In the opinion of the Board any efficient experiments having for their object the discovery of the best means of increasing the duty of irrigation water should be encouraged and developed by the Agricultural Department.

* This resolution as finally accepted by the Board ended "and when new areas are opened the Board would suggest that local Governments should endeavour to safeguard against the danger of erosion when fixing the conditions on which the new lands are given out."

SCIENTIFIC AND VERNACULAR NAMING.

Reprinted from the "Agricultural News," (West Indies)
Vol. XIV, No. 353, 6th November 1915.

Precision was first given to the naming of plants by Linneus or von Linne, the great Swedish physician and botanist who lived in the eighteenth century. Based on sound principles, his binominal system of nomenclature persists in all essential particulars at the present day, and if employed with care and discretion, these binominal designations constitute perhaps the most scientific feature of biology. The names of plants as conceived by Linneus are of two kinds: those of the class and order, which are *understood*; and those of the genus and species, which are *expressed*. The name of the class and order never enters into the denomination of the plant, though at the same time it is always connoted. All plants agreeing in genus have the same generic name, and each generic name must be single; and further, two different genera cannot be designated by the same name. Linneus also laid down the rule that the best generic names are those which express the essential character or habit of a plant. In addition, he formulated other maxims concerning the etymological constitution of botanical names, limiting their construction to Latin and Greek; although many of these latter canons have been criticised as trivial and unimportant they are generally respected at the present day. In regard to the second or specific name, which is supposed to point out the particular species of each genus, we should again remember that those which indicate a decided specific character are the best. A good example of an intelligent specific name is found in *Panicum maximum*, where the generic name denotes the characteristic inflorescence of the genus, and the specific name the idea of size. To designate a variety, it should be mentioned that a third name preceded by the abbreviation 'var,' is used after the second or specific name.

It is not unusual to use the name of a person as a specific name (spelt in the case of botanical, but not of zoological names,

with a capital letter) in the possessive case, as *Thrinax Morrisii*; and in the case of all botanical and zoological names, the name (generally abbreviated) of the authority should be attached to them in order to avoid confusion in connexion with synonyms, thus *Saccharum officinarum*, L. This question of synonym is a wide subject of the greatest importance in biology. We cannot in the space of this article presume to discuss it at any length, but one or two aspects may be referrd to.

Amongst the flowering plants our present knowledge of systematy is sufficiently definite as regards genera for there to be little confusion possible in that connexion. But in the case of specific names it is otherwise, and it is quite common to find the same plant called by different names in different places by different botanists. For this reason the critical revision of genera is a very important branch of pure botany. The trouble lies principally in two directions. First, opinions differ as to what shall constitute a specific difference. Amongst systematic biologists we find two more or less distinct classes of observers who labour under the jocular but expressive names of 'lumpers' and 'splitters.' A 'lumper' is a botanist who shows a tendency to group closely allied forms under the same name, while a 'splitter' exhibits a tendency in the opposite direction, namely, to separate forms of close resemblance under different specific names. Either extreme is wrong, but in the light of modern biology, the tendency to excessive subdivision is perhaps the worse. The point is that a so-called species is not a fixed entity; species are constantly changing by slight mutations, or by acquired variations; and a specific name at best is but a provisional and temporary designation. The second reason for confusion in specific names lies in the circumstance that a describer may not be familiar with the work of others in different countries. This obstacle is being gradually overcome by increased facilities as regards literature and the exchange of specimens; but there still remains a need for more central 'clearing houses.' It should be remembered in the present connexion that the Royal Botanic Gardens, Kew, perform an important service of international influence in the matter of botanical nomenclature. The publication of the Index Kewensis has enormously reduced the confusion

resulting from the existence of synonyms. The work goes on from year to year, and supplements of this remarkable index are issued at convenient intervals. In its pages the names which stand are printed in Roman type, while the synonyms appear in Italics. It is one of the indispensable works of systematic botany.

If we turn to the lower plants, especially the fungi, we find a much greater want of precision than amongst the flowering plants. The classification of the fungi is unfortunately artificial in many respects; nor can this be wondered at, considering their comparatively simple structure. Morphological differences are often very minute and slender, and we not infrequently have to depend upon such varying factors as colour and shape as a means of distinguishing genera and species. In the case of fungi which are not highly parasitic, it is possible to decide upon specific differences by means of comparable cultures. The genus *Fusarium*, for instance, is being studied after this manner in the United States. Different forms of the genus from all over the world are being grown in culture media under the same conditions, and it is hoped by means of the observations obtained to decide what forms are distinct and what are similar. It will be readily realized how important it is to eliminate synonyms amongst the fungi, by considering the case of Die-back disease of cacao. The fungus causing this disease has been known under at least half a dozen different names in different parts of the world, and it was only after a critical examination of the forms in the Federated Malay States that Bancroft came to the conclusion that they were all one and the same organism, which he named *Thyridaria tarda*. The practical importance of a result like this is considerable. The distribution of the fungus becomes definitely known, and legislation can be introduced accordingly. Further, methods of control formerly recommended as applying only to one form of fungus of supposedly limited distribution becomes afterwards applicable, at any rate theoretically, to half a dozen which were at first thought to be distinct.

Generally speaking workers on the fungi are inclined towards the class of 'splitters' previously referred to. There is a tendency to name new species on slender differences, and what is perhaps worse, to split up unduly established genera. Some evidence goes

to show that this has been done for the sake of self-advertisement rather than in the interests of science. It is desirable that when they occur, such tamperings should be ruthlessly exposed.

Having discussed in outline the origin, uses, and some of the dangers attendant on scientific naming, we may profitably consider next the corresponding features of common or vernacular names. It is a mistake to think that common names of plants and animals are necessarily unscientific. Many conform to the canon of Linnæus, which says that names should express the essential character or habit of the plant, and are accordingly highly instructive. Examples of this are very numerous; thus, nut grass (*Cyperus rotundus*) is so called because of the little tubers on the roots of this plant. On the other hand, the name nut grass is unscientific on account of the fact that the swellings are not nuts but tubers, while the plant is not botanically a grass but a sedge. Less open to criticism is the name soap-berry (*Sapindus saponaria*), so called because the fruit of this plant will, when macerated in water, produce a lather like soap: and again love vine (dodder) *Cuscuta sp.*, named after its habit of parasitic embrace; and sea-side grape (*Coccoloba uvifera*), so called on account of its maritime habitat and the superficial resemblance of the ripe fruit to purple grapes. But the common or vernacular name has many serious defects compared with the scientific designation. In the first place a popular name tells us nothing about the class or order to which the species belongs, that is to say, it gives us no clue whatsoever as to its position or status in the classification of the vegetable kingdom. Further, there is the more serious aspect from a practical point of view, that even in the same place a plant may be known by more than one common name. Thus *Bryophyllum calycinum* is known both as Wonder-of-the World and Love Bush; *Borrichia arborescens* as Sea-side Oxeye, Sea-side tansy, and Samphire; and the common *Vinca rosea* as Old Maid or Periwinkle. When we come to consider the matter from an international point of view, it becomes even more obvious that scientific naming is essential. Thus in the case of the genus of fruit trees designated *Anona*, the same species is called by entirely different names in various parts of the world, and it would be hopeless to attempt to use a popular

nomenclature in writing of this group. That such should be the case is almost a foregone conclusion on account of foreign languages. In the West Indies, even, we find that the admixture of French and English, and to some extent Spanish, leads to great confusion in regard to vernacular names. The desirability of using Latin and Greek for scientific names is not, as Linneus thought, because these are less barbarous than the modern languages, but because the dead languages are more fixed and international.

The subject of scientific and vernacular naming is a wide one, but it is believed that in the foregoing we have referred to most of its principal aspects. It will be realised that if employed at all, it is essential to use scientific names intelligently, and with due regard to synonymy and the vernacular. Very frequently the common name is a quicker and better means of indicating a species than the scientific, though as a general rule it may be laid down that it is safer and more scientific to use both kinds of names. In this connexion we could call the attention of writers in the East to the fact that the employment of the Indian vernacular without the scientific, or at least the English equivalent, very often makes their literature quite unintelligible in other countries, which is a pity on account of the high standard and general interest of much of the Indian work. No reference has been made in this article to the pronunciation of scientific names as this is a matter which lies somewhat outside the present subject. If the continental system is unfamiliar to him, the beginner will do well to pronounce Latin in the same way as we should English, in giving the same value to the vowels. Accentuation and some of the consonants occasion a certain amount of difficulty, but very slight attention to the marks and directions to be found in many botany books will lead anyone to a correct pronunciation. It is hardly necessary to point out that a knowledge of the classical languages themselves is of great use in connexion with scientific names and may be regarded as essential to those botanists and zoologists who are engaged in the study of systematy.

NOTES ON INSECT PESTS OF GREEN MANURES AND SHADE TREES

BY

E. A. ANDREWS, B.A.,

Part II.

(*Continued from Vol. V, 1915, p. 62*).

Prodenia litura—Fab.

This moth belongs to the family *Noctuidae.* It is about half an inch long, with a wing expanse of about an inch. The fore-wings are brown, irregularly streaked with dirty yellow, the principal feature of the markings being an irregular network of streaks at about the middle of the wings, at the end (furthest from the point of attachment of the wing) of which will be noticed a small but distinct triangular mark. The hind wings are transparent, with a brown margin and the veins smoky. The body is light brown.

The eggs are laid in clusters of 250-300 on the leaves, and each cluster is covered with a mat of buff-coloured hairs which come from the body of the female moth. They hatch in four to eight days, giving rise to small blackish-green caterpillars which live gregariously for a few days, and then scatter over the plants. The full-grown caterpillar is about an inch and a half long, and greenish black in colour, with a broad dark swollen band across the body just behind the head, a bright yellow longitudinal stripe down the back, and two longitudinal yellow stripes down each side, the upper one bright yellow, the lower one less bright. There is a yellow V mark on top of the head. After a period varying from three weeks in the summer to a month or more in the cold weather the caterpillar forms a red-brown pupa about two inches below the surface of the soil, from which the moth emerges after about a

week in the summer or a month in winter. Caterpillars collected at Borbhetta in September pupated on the 27th of that month and emerged as moths on the 7th of October, *i.e.*, after ten days.

This caterpillar was found in large numbers in September on Mati kalai (*Phaseolus mungo*) and Dhaincha (*Sesbania aculeata*) in experimental plots at Borbhetta, Assam. It has been known to attack tea in Upper Assam (see Watt & Mann, "The Pests & Blights of the Tea Plant," 2nd edition 1903, p. 222.), and is a serious pest of tobacco. It probably attacks all low-growing leguminous plants.

The remedies usually recommended for dealing with this pest are the collection of the buff-coloured egg-masses, and the collection of the caterpillars when they are young and still keeping together.

Maruca testulalis—Geyer.

This moth, which belongs to the family *Pyralidae*, is about three-eighth of an inch long, with a wing expanse of three-quarters of an inch. The fore-wings are light brown, with a few indistinct darker brown markings, and a brown margin. At about the middle of the wing is a broad transverse band, transparent, extending two-thirds of the way across the wing. This band is narrowly edged with dark brown. Between this band and the junction of the wing with the body are two small irregular transparent spots. The hind wings are transparent, with a broad band of light brown along the outer margin which is edged on its inner side with a narrow waved dark brown line. The body is light brown in colour.

The caterpillar of this moth is, when full grown, about three quarters of an inch long, with dark wart-like protuberances on the body, each of which is provided with a short stiff hair. In colour it is light green, with a yellow or brownish-yellow head. The pupa is yellowish green, about three-quarters of an inch long contained in a large cocoon. This changes into a moth in five to eight days.

The caterpillar feeds on the seeds of pulses, boring into pods from outside, the entrance to the gallery being marked by a mass

of excrement. It occurred at Borbhetta, Assam, in September, on Sunn hemp (*Crotalaria juncea*) and Mati kalai (*Phaseolus mungo*) but here it rolled up and webbed together the leaves, and ate holes through them.

The only way in which this pest can be dealt with at present is by collecting and destroying affected pods and leaves.

Maruca amboinalis—Feld.

The moth is very similar in appearance to the foregoing, but is generally a shade larger, and much darker in colour. The markings on the wings are similar, but some of them are less distinct. The caterpillar is very similar to that of preceding species, but a little larger and less slender, and with the wart-like prominences more pronounced.

This caterpillar was found to feed on the flowers and pods of Boga Medeloa (*Tephrosia candida*) at Tocklai in November 1913. Like *Maruca testulalis*, it should be collected and destroyed.

Nacoleia indicata.—Fab.

This, which also belongs to the family *Pyralidae*, is a small moth, about one-third of an inch long, with a wing expanse of two-thirds of an inch. In colour it is yellowish, but very much suffused with light brown in varying quantities, so that its colour may be said to vary from yellow to light brown. The markings on the wings have the appearance of three narrow transverse brown bands, usually incomplete and broken, on the fore-wing, and two similar bands on the hind wing. The outside margins of the wings are very narrowly brown in colour.

The life history of this pest is not known in detail. The caterpillar is light green in colour, with a yellowish-brown head, and when full-grown is about half an inch long. It rolls and webs together the leaves of its food-plant.

The pupa is yellowish-brown, and takes about a week to become mature.

The caterpillar of *N. indicata* is to be found on most pulses, and occurred in small numbers on Mati Kalai (*Phaseolus mungo*) at Borbhetta in September last.

Terias hecabe.—Linn.

This butterfly was described in Part I of this series. It has since been found to attack *Acacia decurrens* at Tocklai, the attack occurring in November 1915.

Bruchus spp.

These insects are small beetles which infest the seeds of leguminous plants both in the field and when being stored. The larva is a tiny white fleshy grub which lives inside the seed. This appears to pupate inside the seed, and the adult then emerges as a tiny hard-backed brown beetle, rather square-ended at the posterior extremity, and with the anterior extremity depressed below the level of the back, short, and tapering towards the front. There are several species of this beetle infesting the seeds of leguminous plants in Assam, between which it is exceedingly difficult to discriminate, but the damage done by all is similar, and the attacked seed will be found to be practically hollow, with a neat round hole where the insect has emerged. It is not possible at present to combat these insects in the field, but any seed which is to be stored should be fumigated before storing as follows. Procure an air-tight box which will hold the seed, and at the bottom place a small bottle, containing carbon bisulphide at the rate of one ounce to every fifteen cubic feet of space. This bottle may have a piece of bamboo tied to the side of the neck at right angles to the length of the bottle. A piece of string should be attached through the cork so that the latter can be pulled out of the bottle by means of the string. The box is then filled with the seed care being taken that the free end of the string can be taken hold of when the box is full. If the string be now pulled, the bottle will be held by the bamboo, which is embedded in the seed on each side, and the cork will come out. Close and fasten the box quickly, and leave for four hours. Seed should be stored in air-tight boxes.

These beetles have been found to attack seeds of Boga Medeloa (*Tephrosia candida*) and *Uraria crinita* at Tocklai, *Desmodium sp.* in Darjeeling district, and an unidentified leguminous plant in Nowgong.

RECENT TOURS.

Chief Scientific Officer.

The first two months of 1916 have been devoted to research touring for the purpose of collecting samples from the Dooars and Darjeeling districts for the Soil Survey. The Chief Scientific Officer is being assisted in this work by Mr. Cooper, the Second Assistant Scientific Officer. This tour began at Teesta Valley garden. Some analyses of the soil of this garden were already available. Other samples were taken. It is curious to note that in these soils there is remarkable root formation which is chiefly noticeable in the case of China bushes. Specimens of such roots were taken and photographed in Calcutta and the photograph will be used to illustrate a forthcoming pamphlet on the relationship between tea roots and the type of soil on which they grow. Samples of soil were taken in the Darjeeling district from Seok, Turzum, Tukvar and Singell.

Recently analyses have been received from the Thurbo, Nurboug, Teesta Valley, Gielle, Turzum, Margaret's Hope, Mim, Tumsong, Springside, Castleton, and Longview Tea Estates. These and the samples just alluded to and the analyses previously made by Mann form the only basis which exists at present for the study of Darjeeling soils. If any managers in this district have analyses of their soils, the Officers of the Department would be very much interested to receive copies in order to add to the data which is already to hand. The Chief Scientific Officer returned from this district on the 29th.

On the 5th of February, he proceeded to Pusa to attend the meeting of the Board of Agriculture. The last meeting of this Board—which the Chief Scientific Officer did not attend owing to absence from India,—was held at Coimbatore at the end of 1913. At the meeting held this year the subjects to which most time was devoted for discussion were veterinary work, cattle breeding and dairying, co-operating credit, and the sugar industry, which

indicates that much attention is being paid at present by the Imperial and Provincial Agricultural Services to these particular agricultural problems.

The Board appoints Committees which meet during the week that the Board is sitting and make recommendations and reports to the Board on the questions which they have been asked specially to discuss. The Board then deals with reports of these Committees and frames resolutions which are submitted to the Government of India. The Government of India attaches considerable weight to the opinions expressed by the Board on the subjects that have been under discussion. The subject which was of chief interest and importance from the tea planters' point of view was the question of soil denudation by rainfall and drainage: conservation of soil moisture. This subject had been brought up in 1913 at the last meeting of the Board, but it was then decided to drop it because the information on the question was so scanty. For this Board meeting a series of papers were prepared by Agricultural Officers in different parts of India. The extreme importance of the question to agriculture generally was recognised and it was considered unnecessary to discuss the point whether serious reduction in the value of land in India has been and is being occasioned in this way, because it is obvious. The substance of the resolutions passed by the Board is given in full in another part of this issue of the Quarterly Journal.

While at Pusa, the Chief Scientific Officer took the opportunity of visiting various field experiments in progress there. He also discussed various questions affecting the planting districts with Mr. Anstead, the Planting Expert to the United Planters' Association of South India, and conferred with other agricultural officers, and consulted the Pusa Library. The week spent there was a profitable one in every way.

On the 23rd of February, the Chief and Second Assistant Scientific Officer proceeded to Jalpaiguri where they met a large number of Dooars planters at the Volunteer Camp. The collection of soil samples in this district for the survey is now being carried on.

ENTOMOLOGIST.

The Entomologist spent the month of January in the Luskerpore district of S. Sylhet. Making Luskerpore his headquarters during that period, he visited Chandpore, Chundeecherra, Amo, Deundi, Rema, Surma, Telipara, Satchuri, and Noyapara gardens during the month.

In this district the termites found in the plucking area take two forms. The first form builds a mound, the bulk of the main nest being above ground level and the queen chamber at or near the level of the surface of the ground. When in this form the termites do not appear to do much damage to the tea. The second form is the one which does the damage. In this form the main nest is deep down below the surface of the ground, and may be a long distance from the point or points at which damage is being done. Small combs, and occasionally large combs, are to be found around and beneath attacked bushes, and galleries lead away from these in all directions. These appear to be auxiliary nests connected with some parent nest, as they never contain a queen or eggs, and yet may be found to contain young ones. It was impossible to trace the galleries to the parent nest either by digging or smoking.

Many interesting observations were made on the relations between these insects and the bushes, on the influence of pruning on the attack, etc., and these observations will form the subject of an illustrated article in the next number of this journal.

On one garden Brown-bug (*Lecanium hemisphaericum*) was found in fair numbers, and all over the district cockchafer grubs (*Lachnosterna*) were plentiful. The Tea-seed bug (*Poecilocoris latus*) was seen several times in the young stages, in the plucking tea.

On the 14th and 15th of February, the Entomologist visited Numaligarh Tea Estate, in the Golaghat district, a garden which suffers from the attacks of *Helopeltis theivora*, and it may not be out of place to give here a short account of what was happening on this garden, and is at present happening on every other garden which suffers from this pest, and to show how a knowledge of these happenings can be turned to good account in organising the collec-

tion of this pest in the most efficient manner. On this garden as on other gardens at this time of year, there were both pruned and unpruned tea. Some of the earlier pruned tea had already made six inches or more of new growth, while late pruned tea had made no growth at all. Cleaning out is done in this garden, and there were very few leaves left on the late pruned tea, yet a close search revealed the presence of eggs in shoots which had been left. In ten days or a fortnight, when these eggs would be hatching, there would be new growth on which the young bugs could feed. In the early pruned tea this had happened, and bushes were found with the new growth punctured, and the young bugs were caught on them. Adults and young were also to be found in the unpruned tea, but owing to their small numbers and the amount of cover afforded by the bushes were exceedingly difficult to catch. On the pruned tea, however, where the amount of foliage was small, the insects were very easily seen, and the bushes on which they were to be found were clearly distinguishable as one walked along the lines. Catching could therefore be carried out most profitably in the pruned tea, both on account of the fact that the insects could be very easily seen there, and because their depredations in this area would do most harm. It was therefore suggested that catching should be commenced directly the first pruned bushes began to put forth leaf, that catching should be commenced on the first-pruned section, the sections being visited in the order of pruning, and that each child should be made to take one line of bushes at a time. As he walked along this line, with his attention confined to that line only, he should notice every punctured bush. He could examine every leaf and shoot of a punctured bush in a very short time, and would then walk along until he came to the next punctured bush. Having finished one line, he would be given another. By organising the catching in this way very few tea mosquitos then present in that section should escape. The next pruned section should then be dealt with, and so on.

MYCOLOGIST.

The Mycologist visited Cachar and Sylhet during November, December and January. Towards the end of January he paid a visit to the Imperial Research Institute at Pusa. Owing to the closing of the hill section of the A. B. Ry., it was not possible for the Mycologist to return to Tocklai at frequent intervals, and it was necessary to make special arrangements for carrying out routine work whilst away on tour. For this purpose he arranged to camp at convenient centres. He did not return to his laboratory for four months and during this prolonged absence the Assistant Mycologist supervised the research work under his instructions. The first camp of the tour was pitched at Badri Ghat, a convenient centre for the Happy Valley and the Lakhipur districts. Here he remained from November 1st to November 30th.

He visited many gardens in both these districts and gave an informal address to a number of planters at Kumbhir. The conditions in these two valleys vary considerably At the Kumbhir end of the Happy Valley the gardens are situated on a plateau. The commonest blight on these plateau gardens is undoubtedly copper blight (*Laestadia camelliae*). Red rust is also prevalent on such soils in this district as are deficient in organic matter.

In some of the Valleys at the edge of the plateau the tea had been flooded and wherever flood deposits had formed many of the bushes had died. All the dead bushes were attacked by a species of *Rosellinia*, (but not by the one which commonly attacks tea). It is however probable that this fungus was not the cause of the death of the plants, but that the influence of the flood deposits so weakened the bushes that they subsequently died from other diseases.

In his address to the planters at Kumbhir the Mycologist talked about copper blight as that disease was very prevalent. There is no need to repeat his remarks here as copper blight has already been described at length in an earlier issue of this journal.

The tea in the Lakhipur district is about equally divided between teelas and bheels. There was no particular blight predominating but all kinds of leaf diseases were present on most sections and

it would seem likely that if the treatment of these diseases were systematically carried out there would be a large increase in yield.

The next camp was pitched at Maragang, a small rest-house, about half way between the Hailakandy and the Chutla Bheel districts.

On the occasion of a volunteer drill breakfast held on the November 20th, at Iringmara, the Mycologist delivered an address on leaf diseases to a large gathering of planters. He first described the structure and functions of leaves. He pointed out that the leaves collect from the sun the energy which the plant requires for the elaboration of the simple chemical substances it obtains from the soil and the air. The actual bodies which take up the energy are the chlorophyll grains. Most of these are arranged in long narrow cells arranged side by side resembling in a cross section of a leaf, a palisading. The leaf besides collecting energy gets rid of the water which is used in conveying the chemicals from the roots. It is also the organ which takes up carbon dioxide (the principal source of carbon) from the air. He went on to point out that the removal or damaging of a leaf interferes seriously with the nutrition of buds which form in its axil. Hence a diseased condition even of the leaves which have become too old for manufacture into tea interferes with the flushing. Leaf diseases may be divided into two groups—those which may be directly traced to deficiencies in the soil and those which have no apparent connection with soil conditions.

The former class includes Brown blight, Grey blight, Dieback disease (*Gleosporium*) and Red rust. The treatment of these must include attention to the soil. It is best in such cases to have analyses of the soil made and to submit these to the Scientific Department for report. Frequently bushes require other treatment in addition to manuring. The stems are frequently hidebound and diseased. Careful pruning followed by a caustic wash would be beneficial. Applications of Bordeaux mixture or lime sulphur solution during the early rains would stimulate the plants to take advantage of the improved soil conditions and also help to kill fungal diseases.

The latter class includes Copper and Blister blight. These two diseases, the latter of which is not frequently found in Cachar, require a definitely fungicidal treatment. During the cold weather all unpruned and light pruned tea should be treated with a caustic wash. This treatment will help the bushes to make an early start as well as kill any fungus and lichen which may be found on the bushes at the time of application. This should be followed by an application of lime sulphur wash immediately after the first flush has been plucked. If blights are still prevalent another application immediately after the second flush would be required. The benefit which the bushes would derive from spraying with the above-mentioned solutions is not likely to be confined to that accruing from the removal of diseases. It had been proved that these solutions exercise a remarkably stimulating effect on the plants to which they are applied. It has not however been ascertained that the gain on this account alone would be sufficient to give a profit on the cost of the applications.

The Mycologist visited most of the gardens in the district during his stay. There were two things which particularly interested him. The deterioration of teelas and the deterioration of bheels. The former formed the subject of a lecture given to the North Cachar planters and is dealt with below.

In regard to the latter the yields from parts of certain bheels have for some time been going off. No disease is present of sufficient intensity to warrant the assumption that the reduction in yield was due to any such. The soil retained its original nature to all appearances. It was not fluffy like certain other bheels which were mentioned by the Chief Scientific Officer in the report of his tour in Sylhet.* Yet the tea showed unmistakable signs of dying out. The general morphology of the roots of the bushes indicated that a pan had formed and a careful examination of soil showed that an impervious layer of soil had been formed at distances from the surface varying from one foot to one yard. This layer was quite soft but appeared to hinder the aeration of the soil beneath it and it also interfered with the movement of soil water. The bushes were

* *Vide* Quarterly Journal 1915, Part II, page 44.

in consequence water-logged in the rains and dried up in the cold weather. The only way to get rid of this pan is to trench through it. The application of lime would also help by causing the fine particles of which the pan is formed to join together to form larger ones. On referring to early records of one of these bheels it was found that Dr. Mann had years ago predicted the formation of such a pan on the evidence of a soil analysis.

The Mycologist gave a short address to a large gathering of planters in the Hailakandy district at the Monacherra Club. The address followed a volunteer drill and breakfast. Referring to the influence of pruning on fungus diseases he pointed out that pruning removes a great deal of moribund and dead wood from the bushes. There were many fungi which were not able to attack vigorous healthy growth, but which would attack plants or portions of plants which are in a weakened condition. Pruning by promoting more vigorous growth and by removing weak and dead twigs tends to reduce the damage caused by such blights. The wounds made in pruning were however specially liable to the attacks of certain diseases and large wounds should always be protected by something. Coating with Bordeaux mixture, lime, etc., were discussed. The Mycologist suggested that the wounds be charred with a painter's blow-lamp. This method is better than painting as the charcoal will not peel or wash off. It is a perfectly satisfactory protection against both insects and fungi. It however takes a little longer time to apply.

The Mycologist visited many of the gardens in the Hailakandy district. During his tour in this valley he particularly noticed the diseases which attack tea after mosquito blight has weakened it. Most of the sections which has been badly blighted were subsequently attacked by red rust. The red rust not only attacked the stems but more particularly the leaves where it formed large grey patches resembling those formed by grey blight. The red rust was undoubtedly causing very serious damage and it would seem advisable to do something to help the bushes to throw it off. An application of Bordeaux emulsion immediately the mosquito shows signs of abating and repeated a fortnight later would undoubtedly be beneficial.

After touring the Hailakandy district the Mycologist visited North Cachar. The camp was moved to Badarpur ghat. This district is more conveniently divided into two portions, the gardens round Kalline and those round Dooloo. The Mycologist arranged a meeting in each of these places. The first was held at Kalline.

On December 12th here he discussed the blights which attacked tea growing on teelas. He pointed out that they were those which were generally found on tea growing on soils deficient in some constituent. It did not require the services of a chemist to find out that organic matter was required on most teela soils. It was not much use trying to eradicate the diseases without at the same time dealing with the principal factors which laid the bushes open to their attack. At the same time application of spray fluids of a tonic nature such as Bordeaux mixture would help the bushes to take advantage of the improved conditions of the soil. After the lecture the planters present discussed the treatment of teelas paying special attention to the prevention of wash. The Mycologist referred to Dr. Hope's observations which would shortly be published in the pamphlet on his tour in Java. He went on to point out that nature's way of protecting soil from wash was by covering it with plants and suggested that it might be profitable to protect the soil of teelas by growing a cover crop between the bushes throughout the rainy season. It was important to select the right kind of crop. If labour were scarce it was better to grow a plant which would not require cutting during the plucking season. There were many such plants in the jungle. He pointed out various species of wild *Desmodium*. The soil of course required aeration during the rains but this could be provided by forking round the bushes. The cover plant would prevent wash and provide organic matter. In the case of leguminous crops it would also provide nitrogen. The growth of such crops would not so seriously interfere with the growth of the tea as the loss of soil which would be washed away if they were not grown. In the cold weather the bulk of the crop might be hoed in leaving lines along the contours or the edges of terraces to provide seed for the next season. These lines would, in the case of unterraced soil, help to form terraces. The discussion was a most interesting and

useful one. On the 23rd of December the Mycologist met a number of planters at the Barkola Club and gave a short address on the diseases which follow attacks of mosquito blight and how the damage which they caused might be reduced by spraying.

At the end of December the camp equipment was returned to Tocklai and during the first week in January the Mycologist visited the Chargola Valley in Sylhet, where he spent a most interesting time visiting most of the gardens. The blights resembled those found in the Hailakandy district which is in the next valley.

Towards the end of January as stated above the Mycologist paid a visit to the Imperial Research Institute at Pusa. Here he spent a very profitable week consulting the library and conferring with Dr. Butler the Imperial Mycologist. Dr. Butler had recently returned from Home where he spent some months in the Kew laboratories. Whilst there, he took the opportunity of examining some of the type specimens of tea blights. By measuring the spores of the fungus which causes Grey blight in tea he found that the spores of true *Pestalozzia palmarum* the cause of Grey blight in palms are much smaller than those of the fungus which causes the Grey blight of tea. This may possibly be accounted for by the difference in host plants—a point which can only be settled by cross-inoculations. It may, however, be found that Grey blight of tea is not found on jungle plants ; but is confined to tea and allied species. This information would considerably influence the treatment. The Mycologist is very grateful to Dr. Butler for his kindly advice and help.

NOTES.

Thrips.—It is a matter of common knowledge that the thrips insect of tea, which is a serious pest in Darjeeling, is seldom destructive in the plains. Instances such as this are readily accounted for by the difference in elevation and climate, and such an explanation seems sufficiently feasible until cases are reported of serious attack in the plains, such as the one mentioned in Part IV of the volume of this Journal for 1915*. In this case the attack came on after the tea had been flooded for several days, and would seem to have been due rather to abnormal soil conditions rendering the bushes less resistent to attack than to any other cause. This explanation would seem to be borne out by the observation of H. A. Ballou, Entomologist to the Department of Agriculture for the West Indies, on the "Red-banded" or "Cacao" thrips (*Heliothrips rubrocinctus*) in Grenada, and his conclusions are put forward in the following summary:†

> "*Heliothrips rubrocinctus* (cacao thrips) is permanently present and generally distributed in Grenada, and occurs year after year in the same localities, in the same portions of the cacao plantations and perhaps on the same trees. It is most abundant during the last three months of the year in those estates which lie on the lower lands round the periphery of the island; in the dry months a considerable improvement in the condition of the trees takes place. This is contrary to the state of affairs prevailing in other countries. In Grenada thrips may be present in cacao for several years and never increase in numbers sufficiently to attract attention. The attacks of thrips indicate that something is wrong with the plant or with the conditions under which it is growing. The patches

* Page 114.

† Taken from "The Review of Applied Entomology," October 1915.

examined suffered from root disease, bad drainage or unfavourable soil conditions. Permanent thrips control will result from the eradication of root disease, and better drainage and soil conditions, rather than from spraying."

Copper Blight.—During a recent visit to England Dr. Butler, the Imperial Mycologist, found that *Laestadia thea Racib.* the name commonly applied to the fungus which causes copper blight was synonymous with *Laestadia camelliae Cke.* As the latter name is the earlier, this fungus will be referred to as *Laestadia camelliae Cke.* It may also be pointed out in this connection that some writers use the name *Cingnardia* in place of *Laestadia* on the grounds that *Laestadia* was formerly applied to a group of flowering plants. As the majority of Mycologists use *Laestadia* that name will continue to be used in the Indian Tea Association's publications.

The fungus which causes the diplodia root disease of tea has been found to be identical with *Thyradaria itarda Baner.* referred to above.

ON SENDING SPECIMENS OF INSECTS.

Insect specimens sent for report are of very little use unless they reach the laboratory in such a state that they are capable of identification, and in sufficiently good condition to admit of their being preserved for reference, and the object of this note is to give hints on a few simple methods of packing insects for despatch by post, which any planter will be easily able to employ. Three points are to be emphasised :—

1. The unsuitability, as a rule, of the tin boxes usually employed. Tin does not absorb moisture, and specimens placed in boxes of this material generally arrive in a mouldy condition, especially if, as often happens, the parcel has to be redirected.

2. Too many specimens should not be put into one box, as they never arrive in good condition. Half a dozen good specimens are infinitely more valuable than fifty poor ones.

3. Living insects should always have something to cling to.

The non-observance of one or other (sometimes all) of these three points causes the ruination of ninety per cent. of the specimens which reach this laboratory. It is quite easy to comply with these conditions, and a little consideration will show the desirability of doing so. Living specimens should be given, supply of food, if it be available. The best method in the case of plant-feeders is to place a few of the insects, with a moderate supply of food, in dry grass in a wooden box. If the insect be fairly large, a few small holes in the box will be advisable, but with very small insects, given a sufficiently large box, this is unnecessary. Failing a wooden box, a cardboard box will do, but this should always be strengthened by flat pieces of wood above and below to avoid damage in the post from wooden packages, and by stamping, etc. Metal boxes or glass bottles should never be used on such occasions, for the reason stated above. One or two very small insects, such as tiny leaf-rollers, travel quite well with a leaf or two in a chip pill-box.

Insects taken from the earth should not be sent in soil. Plenty of dry grass is much better.

When sending borers, cut off the piece of stem or root with the insect inside, and put it into a metal box. Some dry grass or paper will keep the wood from shaking about, and a second piece of stem, if the first be small, will give the insect something to do if he should bore his way out of the first piece. Boring grubs are best sent in spirit, if there is any doubt as to their safety when packed otherwise, but it should be remembered that it is exceedingly difficult, and in many cases impossible to identify such except from the adult, and if they can be sent alive with a good supply of food it may be possible to rear them, and thus to arrive at a correct identification. Wooden and cardboard boxes are obviously unsuitable for boring insects.

Insects sent without food should be put in dry grass, packed loosely in a box. This will give them something to cling to, and they can get into it, and will not be battered about. Dead hardbodied insects, such as beetles, grasshoppers, etc., will travel safely under such conditions. Small dead beetles, caterpillars, grubs and mites, should always be sent in spirit, and all delicate insects are best sent in this way. Scale insects will travel dry, in situ, in an envelope placed between two pieces of cardboard, or in a larger stiff envelope, but the entomologist would be exceedingly grateful if planters sending specimens of such would send one sample in this way, and another sample in spirit.

Butterflies and moths travel moderately well in a box which contains some loose tissue paper for them to cling to, but they knock themselves about by fluttering, and it is best to kill them first, by pinching the thorax, and send them in an envelope, or a folded piece of paper, placed in a small box.

If planters would endeavour to send samples packed in such a manner as to ensure their safe arrival, or at any rate to render it possible, they would greatly assist the work of the department.

C. O. P.—1100—2-5-1916